PRESIDENCY UNIVERSITY

Department of Mathematics

PhD Thesis Synopsis

Title of the Proposed Thesis:

On Graphs Defined on Algebraic Objects

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Abstract

Starting from Cayley graphs, the research on graphs defined on algebraic objects like groups, rings, vector spaces forms an integral part of algebraic graph theory. Such graphs reflect the algebraic properties of the underlying structure and hence it is useful to study the algebraic objects with the help of graphs defined on them.

Our present study is focussed on defining graphs on groups and rings and investigate their properties. This includes studying the interplay between algebraic properties of the objects and their corresponding graph properties. The graphs studied by us are defined below:

Let G be a group and S be the collection of all non-trivial proper subgroups of G. The comaximal subgroup graph [**?**] of G, denoted by $\Gamma(G)$, whose vertex set is S and two vertices H and K are adjacent if and only if $HK = G$.

Let R be a commutative ring with identity. The prime ideal sum graph of R, denoted by $G(R)$, is a graph whose vertices are non-zero proper ideals of R and two distinct vertices I and J are adjacent if and only if $I + J$ is a prime ideal of R.

We study different structural and isomorphism properties of these graphs which provides nice insights on the algebraic as well as graph theoretic aspects.

In this thesis, we intend to present our findings on some graphs associated with groups and rings, and their interplay with algebraic properties of the underlying structure. The contents of the proposed thesis is divided into five tentative chapters as follows:

Chapter - 1 : Introduction
Chapter - 2 : Comaximal Subgroup Graph of a Group
Chapter - 3 : Co-Maximal Subgroup Graph of $\mathbb{Z}_n$ and D_n
Chapter - 4 : Prime Ideal Sum Graph of a Commutative Ring
Chapter - 5 : Annihilating-Ideal Graph of $\mathbb{Z}_n$

The following are the list of publications related to the proposed thesis:

1. **M. Saha**, A. Das, E.Y. Celikel and C. Abdioglu, Prime Ideal Sum Graph of a Commutative Ring, *To appear in* Journal of Algebra and its Applications.

2. A. Das, **M. Saha** and S. Alkaseasbeh, On Co-Maximal Subgroup Graph of a Group, Ricerche Di Mathematica. `https://doi.org/10.1007/s11587-022-00718-0`

3. **M. Saha**, S. Biswas and A. Das, On co-maximal subgroup graph of $\mathbb{Z}_n$, Int. J. Group Theory, Vol 11, No. 4, pp.221-228, 2022.

4. **M. Saha**, S. Biswas and A. Das, On perfectness of annihilating-ideal graph of $\mathbb{Z}_n$, Communications in Combinatorics and Optimization,Vol 8, No. 1, pp. 173-181, 2023.

5. A. Das and **M. Saha**, On co-maximal subgroup graph of D_n, *Submitted*